SunSet™ E1

SPECIFICATIONS

Connectors/Ports
2.048 Mbit/s E1 interfaces: Tx, Rx, Ext Clock
   75Ω unbalanced BNC (f) standard
   75Ω (option): Replaces BNC (f) w/75Ω 1.6/5.6 mm (f), 120Ω balanced BR2, or 120Ω Bantam
Printer/Remote Control: 8-pin mini DIN, RS232C/V.24 serial port, DTE
DC input for charging internal battery

Status/Alarm Indicators
20 super-bright LED indicators
Current status and alarm history
Power (green, on), Battery (red, when low)
Green: Signal, HDB3 detected, PCM-31, PCM-30, CRC-4 detected, Pattern Sync
Red
   For Alarms: LOS, LOF (FAS, MFAS or MFAS-CRC), AIS, FAS RAI, MFAS RAI, ARTIFICE, Pattern Sync Loss
   For Errors: Code, Frame, Bit, (any) Error
Yellow: Pattern Inverted

E1 General
Bit Error test rates: 2.048 Mbit/s, N (contiguous) and M (noncontiguous) x64 kbit/s (N & M=1 to 31). Separate and independent receive and transmit timeslot selection. Automatic configuration to timeslots containing test pattern
Drop and insert to internal test circuitry N or M x64 kbit/s test pattern, or 64 kbit/s A-law decoded VF channel to built-in speaker/microphone
Line Coding: HDB3, AMI selectable
Framing: Unframed, PCM-30, PCM-31 with or without CRC-4. Conforms to ITU-T G.704
Graphical display of test set configuration. Key parameters for Tx and Rx interfaces and current status of alarms and errors

Test Pattern Generator
General: All 1s, All 0s, Alt 1010, 1-in-8, 1-in-16, 3-in-24
PRBS: 2^n-1, n= 6, 7, 9, 11, 15, 20, 23. Conforms to ITU-T O.151, O.152, O.153, and ANSI V.52, V.57
Others: 20ITU, 55 Octet, FOX
Programmable: 8 patterns, up to 2048 bits long with user definable labels of up to 10 alphanumeric characters for each pattern
Send and receive inverted test pattern
Send pattern independent of receive pattern

Transmitters
Clock source
   Internal: 2.048 MHz (± 5 ppm). Adjustable over ± 50 kbit/s/2 kbit/s steps and ± 200 bit/s/2 bit/s steps (± 100 ppm/1 ppm steps) with option SS213
   Loop: AMI or HDB3 (recovered from Rx port)
   External clock input port: (REF. CLK) 75Ω; 120Ω optionally
Line coding: HDB3, AMI

Pulse shape: Conforms to ITU-T G.703
   75Ω unbalanced: ± 2.37V$_{bp}$ (± 10%) or
   120Ω balanced: ± 3.0V$_{bp}$ (± 10%) with optional balanced interface
Transmit level
   Selectable: 0 dB or -6 dB
Programmable Send Frame Words: Programmable NFAS Sa4 Sa8 bits (option SW210), manual/auto E-bit setting (SW211). Set NFAS bit 3 (FAS RAI), set 4 bit NMFAS word to 1 or 0 (SW210)
Set idle channel code and ABCD bits

Error/Alarm Injection
Code and/or bit error: Programmable burst of 1 to 9999 errors manually, or continuous rate of 2×10^{-3} to 1×10^{-9}
FAS: Error consecutive frames, programmable 1 to 5 FAS words manually, or continuous rate of 2×10^{-3} to 1×10^{-9}
CRC-4: Single, or continuous rate of 2×10^{-3} to 1×10^{-9}
E-bit (option SW211), Bit-Slip: Single manually
All channels: Single per timeslot manually or continuous rate of 2×10^{-3} to 1×10^{-9}. Errors injected equally in all selected channels in N or M x64 kbit/s (N & M=1 to 31), or all 30, 31 or 32 channels in E1 (option SW171)
Generate AIS, TS16-AIS (PCM-30), MFAS RAI (PCM-30), FAS RAI (PCM-30 and -31), ARTIFICE alarms

Receiver
Frequency range: 2.048 Mbit/s ± 30 kbit/s (± 6 kbit/s from clock)
Input sensitivity
   Terminate, Bridge: +6 to -43 dB with ALBO
   Monitor: -15 to -30 dB resistive loss
Auto configuration for framing (PCM-30, PCM-31 or unframed), CRC-4 (with or without) and line coding (AMI or HDB3)

SunSet™ E1

Impedances
    Terminate, Monitor: 75Ω unbalanced, 120Ω balanced (optional)
    Bridge
Jitter tolerance to ITU-T G.823

External Clock Interfaces
Input Impedance: 75Ω unbalanced, 120Ω balanced (optional)
Input Sensitivity: 0 to -30 dB resistive
Line Coding: HDB3
Frequency Range: 2.048 Mbit/s ± 300 ppm

Measurements
Large character display of NO ERRORS
All measurement screen headers include Elapsed Time, Remaining
    Time, Framing Type, Code, Input Port Termination State, Tx
    Pattern, Rx Pattern and CRC-4 state
Code errors: Error count, ratio and current ratio, ES, %ES, SES, %SES,
    UAS, %UAS, AS, %AS, DM, %DM
Frame errors: FAS, MFAS and CRC-4 errors count and error ratios, ES,
    %ES, SES, %SES, UAS, %UAS, EFS, %EFS, DM, %DM
Bit errors: G.821 analysis; bit error, ratio and current error ratio, ES,
    %ES, SES, %SES, UAS, %UAS, AS, %AS, DM, %DM, Count and %
    of loss of Patt Sync seconds, bit slip count
Signal and Alarm: Count of LOS seconds, AIS seconds, LOF seconds,
    FAS RAI seconds, MFAS RAI seconds, ALL TS AIS seconds; fre-
    quency in Hz, deviation in ppm, wander in UI
E-bit Errors (option SW211): Error count, ratio and current ratio, ES,
    %ES, SES, %SES, UAS, %UAS, AS, %AS, DM, %DM
Frequency Measurements: Max, Min, Current in Hz; Selectable
    Frequency resolution: 1, 0.1, 0.01 Hz. Deviation from 2.048 Mbit/s
    in ppm; Clock Slip & Wander in UI. Bar graph indicates direction
    & rate of signal frequency slipping in relation to measurement clock
Settable frequency threshold for frequency error indication via printer
Signal level (V_{bp+}, V_{bp-} and V_{pp} in dBdsx) range: +7 to -36 dB
M.2100/550 Measurements: Pass/fail status, %ES, %SES
    Programmable measurement period and %HRP
ITU-T G.826 Analysis: CRC-4 block based
    EB, BBE, %BBE, ES, %ES, SES, %SES, UAS, %UAS, AS, %AS
Settable threshold for "low signal" range, 0 to -40 dB
    Indication via reverse video message at the top of the screen
Print on event, can be enabled or disabled
Automatic printout at settable time intervals: Up to 999 hours or
    999 minutes
Measurement duration continuous or timed; settable up to 999
    hours, in 1 minute steps
Programmable time and date for start and stop of measurement

Other Measurements
View received data
View live traffic 2048 bits long (8 frames or one sub-multiframe) in
    PCM-30, PCM-31 or unframed
Display 8 timeslots per screen
Stores 32 scrollable screens, hold screen, print
Information displayed in ASCII, reverse ASCII, binary and hex
View timeslot 0 (FAS, NFAS, CRC, MFAS/CRC words, E-bits, Sa4-Sa8,
    A-bit) in PCM-30 and -31: 16 frames (option SW210)

View timeslot 16 (MFAS, NMFAS, ABCD bits for all 30 channels) in
    PCM-30: 16 frames (option SW210)
Propagation Delay
Round trip signal transmission delay
Measures in microseconds and UIs (Unit Intervals)
Histogram Analysis
Graphical display of accumulated errors count (Bit, Code, CRC, FAS/
    MFAS) and alarm seconds (LOS, AIS, LOF, Patt Sync Loss, FAS RAI,
    MFAS RAI)
Stores current results and past 7 days per hour, most recent 24 hours
    per 15 minutes
Pulse Shape Analysis
Scan period, 500 ns
On screen pulse shape display with G.703 pulse mask verification and
    pass/fail indication
Displays pulse width, rise time, fall time in ns (resolution 1 ns),
    %overshoot, %undershoot (resolution 1%), level in dB (resolution
    0.1 dB)
Pulse mask storage and printing on a Seiko DPU-411 or equivalent
    printer
Transmit Stress: Simultaneous display of code and bit errors, pro-
    pagation delay; set internal clock over ± 100 ppm with 1 ppm step
Save 20 test results or 800 error and alarm events, available to screen
    view and/or print. Lock/Unlock capability
Automatic Stress: Automatically determines the receiving
    equipment's upper and lower frequency capture range

Voice Frequency Capabilities
Tone generation: 0 dBm0/820 Hz and 0 dBm0/1020 Hz, can be
    enabled or disabled. Selectable Tx timeslot
VF Measurement: 30 Hz to 3904 Hz, 1 Hz resolution; +3 dBm0 to 60
    dBm0, 0.1 dB resolution
Companding: A-law
Built-in microphone for talk
Monitor speaker with volume control
ABCD bits monitor & transmit and view channel data byte (binary
    format) in selected channel
Simultaneous view of 30 channels ABCD signalling bits (PCM-30)

Dialing Capabilities
DTMF dialing
    32 digits, 10 speed dial numbers with alphanumeric names, send
        digits 0 . . . 9 and pause
    Programmable dial and interdigit (silent) period
MF dialing
    32 digits, transmits CCITT MR2 MF tones, send digits 0 . . . 9 and
        combination 11 to 15
    Choice of forward or backward tone set

Remote Control (SW100)
VT102 terminal emulation remote control via 8-pin mini DIN RS232C/
    V.24 DTE port
Same graphical interface on terminal/PC monitor as on the test set
Circuit status table provides current and historical information on
    test set LEDs
Bitmapped histogram and pulse shape cannot be remoted

Enhanced Error Injection (SW171)

Errors are injected equally in all selected channels for N (contiguous) or M (noncontiguous) x64 kbit/s. For 2 Mbit/s, N=30 for PCM-30, N=31 for PCM-31, N=32 for unframed

Inject burst of 1 manually or rate from $2x10^{-3}$ to $1x10^{-9}$

Advanced Frame Word Applications (SW210)

One-screen display of NFAS words for 6 odd-numbered frames
Set Sa4, Sa5, Sa6, Sa7, and Sa8 to 1, 0 or alternate 1/0 or 0/1
Set 4 bits of NMFAS bits to 1 or 0
Set ABCD bits of selected TS to 1 or 0
Set Bit 3 of NFAS word to 0 or 1 (FAS RAI)

E-BIT Analysis and (SW211)

E-bit error measurement with ITU-T G.821 analysis
Transmit E-bits in response to received CRC-4 error
Inject E-bit error manually (single)

GENERAL

CE mark
Languages: English, French, German, Italian or Spanish (specify)
Field upgradable PCMCIA firmware card
Store and recall 10 instrument configurations by name
16 line x 32 character LCD display screen with backlight
   Backlight continuous or time-settable from 1 to 99 minutes
Internal Battery: Lead acid type
   Battery operation time: 2 hr, 15 min nominal
   Unit charging time: 8 hours nominal
Power Source: 110/120/220/230/240 VAC @ 50/60 Hz
Printer/Communication port
   Text: Standard ASCII scape sequence code
   Graphics: Standard Bit-image Graphic Mode (dot matrix)
   Baud rate: 1.2, 2.4, 9.6 and 19.2 kbit/s (9.6 kbit/s preferred)
   Parity: None, even or odd
   Stop-bit: 1 or 2 bits
   Bits per character: 7 or 8
   Selection of CR or CR+LF
   Print screen via dedicated key
Self test and internal Tx frequency deviation calibration
Clear print buffer, erase NVRAM
Configure test set to preprogrammed factory default
Display version/option configuration of the test set
Operating Temperature: 0˚C to 50˚C
Storage Temperature: -20˚C to 70˚C
Humidity: 5% to 90% noncondensing
Size: 10.5 cm (W) x 6 cm (H) x 27 cm (L)
Weight: 1.2 kg (approx.)

ORDERING INFORMATION

Test Set

SSE1   SunSet E1 with 75Ω unbalanced BNC (f) connectors
Includes Internal Lead Acid Battery, AC Battery Charger (SS121B, 220VAC, 0.6A), User's Manual (SS209), and Software cartridge

Note 1:   All other accessories must be ordered separately

Note 2:   110, 120 or 240 VAC Chargers may be substituted at no additional charge at the time of order

Hardware Options

Please specify alternate connectors/impedances if required:

-A   Replace all 75Ω BNC (f) with 1.6/5.6 mm (f) 75Ω unbalanced connectors

-B   Replace all 75Ω BNC (f) with 120Ω BR2 (f) balanced connectors

-C   Replace all 75Ω BNC (f) with Bantam 120Ω balanced connectors

SS137   High Capacity Battery Package
NiMH battery pack (SS139) 100-240 VAC AC/DC adapter (SS138C), Power Cord (SS429)

Note 3:   Alternate power cord can be substituted at N/C (Please specify)

SS213   Transmit Frequency Shift
Vary transmit frequency over ± 50 kbit/s in 2 kbit/s steps, and ± 200 bit/s (100 ppm) in 2 bit/s (1 ppm) steps. Set transmit level to 0 dB or -6 dB

Note 4:   All hardware options must be specified at the time of order

Note 5:   Refer to "Other Accessories" for Bantam/310 cables, etc.

Software Options

SW100   Remote Control
Includes printer cable (SS115B) and null modem adapter (SS122A)

SW171   Enhanced Error Injection
Bit errors injected simultaneously in all channels

SW210   Advanced Frame Word Applications
Setting of Sa4 to Sa8 bits in NFAS word. Display of TS0 and TS16

SW211   E-bit Analysis and Injection
E-bit error measurements and analysis. E-bit error injection in auto/manual modes. (SW210 required)

Note 6:   Software cartridges may be upgraded to include additional options at any time

Accessories

SS101 Carrying Case

SS104 Cigarette Lighter Battery Charger
To be used with SunSets equipped with sealed Lead Acid battery

SS104C NiMH Cigarette Lighter Battery Charger, Output 15.5V DC@2.5A (For use on SunSets equipped with NiMH batteries only)

SS115 DIN-8 to DB25 RS232C Printer Cable
Replacement printer cable for earlier serial printers such as SS118

SS115B DIN-8 to DB-9 RS232C Printer Cable
Included when either SW100 or SS118B/C is ordered

SS116 Instrument Stand

SS117A Printer Paper, 5 rolls, for SS118B/C

SS118B High Capacity Thermal Printer
With internal rechargeable battery. Includes cable (SS115B) for connection to SunSet and 110 VAC charger

SS118C High Capacity Thermal Printer
With internal rechargeable battery. Includes cable (SS115B) for connection to SunSet and 220 VAC charger

SS122B Null Modem Adapter
DB9 (f) to DB9 (f) with Full Handshaking. Included with Remote Control.

SS122C Null Modem Adapter
DB25 (f) to DB25 (f) with Full Handshaking

SS123A SunSet Jacket
Provides additional weather protection for SunSets (SS123B Carabiner Hook included)

SS210 Conversion Cable, BNC (m) 75Ω to 3-pin banana CF (m) 120Ω, 2 m

SS211 Cable, BNC (m) 75Ω to BNC (m) 75Ω, 2 m

SS214 3 ea. Female to Female Adapter Plugs
Changes 3-pin banana male to female

SS216 Conversion Cable, BNC (m) 75Ω to BR2 (m) 120Ω, 2 m

SS217 Cable, 1.6/5.6 mm (m) 75Ω to 1.6/5.6 mm (m) 75Ω, 2 m

SS218 Conversion Cable, 1.6/5.6 mm (m) 75Ω to 3-pin banana CF (m) 120Ω, 2 m

SS219 Cable, BR2 (m) 120Ω to BR2 (m) 120Ω, 2 m

SS220 Cable, BNC (m) 75Ω to 1.6/5.6 mm (m) 75Ω, 2 m

SS223 Cable, BR2 (m) 120Ω to 3-pin banana CF (m) 120Ω, 2 m

SS224 Conversion Cable, BNC (m) 75Ω to 3-pin banana CF female 120Ω, 35 cm

SS227 Conversion Cable, BNC (m) 75Ω to Probe clips 120Ω, 2 m

SS429 2-pin Euro-style Power Cord

SS436 Conversion Cable, RJ-48 (m) 120Ω to two BNC (m) 75Ω, 2 m

SS437 3-prong South African Power cord

SSE1CC Certificate of calibration/compliance when specified at the time of order

SSE1CCM Certificate of calibration/compliance with measurement data when specified at the time of order

SSE1W SunSet E1 Extended Warranty
Extends standard 1-year warranty period to 3 years. Excludes battery and accessories which are warranted for 1 year.

Other Accessories

SS106 Cable, Single Bantam (m) 120Ω to Single Bantam (m) 120Ω, 2 m

SS108 Cable, Single Bantam (m) 120Ω to Single 310, 2 m

SS109 Cable, Single Bantam (m) 120Ω to Probe Clips 120Ω, 2 m

SS130A 19"/23" SunSet Rack Mount - Removable

SS130B 19"/23" SunSet Rack Mount - Permanent Unit

SS212 Conversion Cable, BNC (m) 75Ω to Bantam (m) 120Ω, 2 m

SS215 SunSet E1 Training Tape, English (specify SS215K for Korean)

SS225 Cable, Bantam (m) 120Ω to 3-pin banana CF (m) 120Ω, 2 m

Replacement

SW2501 1 Mb Software Replacement Cartridge
Specify model and serial number

SS113A AC Battery Charger, 120 VAC
Output 0.6A at 12 VDC. To be used with SunSets equipped with Lead Acid battery

SS113B AC Battery Charger, 110 VAC
Output 0.6A at 12 VDC. To be used with SunSets equipped with Lead Acid battery

SS121B AC Battery Charger, 220 VAC, 50/60 Hz, 3-prong IEC connector. Output 0.6A at 12 VDC. To be used with SunSets equipped with Lead Acid battery

SS121C AC Battery Charger, 240VAC, 50/60 Hz, 3-prong IEC connector. Output 0.6A at 12 VDC. To be used with SunSets equipped with Lead Acid battery

SS123B Carabiner hook for SunSet Jacket

SS138D SunSet AC Adapter, 100-240 VAC, 50/60 Hz input, output 15VDC@2A. Only for use with SunSets equipped with NiMH battery pack

SS139 6-cell NiMH battery Pack. 7.2VDC, 1.8Ahr

SS209 SunSet E1 User's Manual

SS431 3-prong Power Cord for use in North America and Asia

Note: Specifications subject to change without notice.
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